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# *Hypleurochilus bananensis* (Poll, 1959) (Pisces, Blenniidae) in Italian seas: distribution, habitat preference and sexual dimorphism

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Hypleurochilus bananensis *is one of the rarest species of Blenniidae in the Mediterranean Sea. Only few records have been made in the whole Basin. Due to its rarity,* H. bananensis *is poorly studied and little is known about its biology. In this study, we provide additional data on this rare species. In particular, we describe its habitat, sexual dimorphism, presence and distribution with several new records in both Tyrrhenian and Ionian Sea. Studies were conducted in the period from 2011 to 2014. Observations were carried out both by snorkelling and SCUBA diving. In the natural environment, we observed the behavior and coloration in both sexes. For two mature sampled specimens of both sexes, we examined the morphology, providing the first detailed information about the differences between them. Sexual dimorphism is very pronounced and past descriptions of this species were based only on female specimens. This could lead to misidentification cases. Indeed, especially the morphology and chromatic pattern of the male are similar to those of other combtooth blennies species. Furthermore, we report data about reproduction, habitat preference and consideration about its presence in Italian seas.*

**Key words:** *Hypleurochilus bananensis*, sexual dimorphism, morphology, Mediterranean Sea, Blenniidae, ballast water, coastal lagoons

## INTRODUCTION

The family Blenniidae, with about 400 species, is one of the largest families of fishes, distributed worldwide in both tropical and temperate waters. Most of the species inhabit shallow waters of warm and temperate seas, although some are brackish or freshwater. In Italy, there are 20 reported species of which 19 are marine species (some also in brackish water) (RELINI & LANTERI, 2010) and 1 is a freshwater species (KOTTELAT & FREYHOF, 2007). On the basis of new records, most of the Italian species are widely distributed (FALZON, 2009; FALZON & FALZON, 2013; TIRALONGO, 2012A; TIRALONGO 2012B; TIRALONGO *et al.,* 2013). Identification of Italian combtooth blennies in their natural environment is possible in most cases. Important diagnostic features are the presence and the morphology of cirri and other "cephalic tentacles", the morphology of the head and particular and constant pattern (ORLANDO-BONACA & LIPEJ, 2010). With the recent discovery of a new species in Brazil (PINHEIRO *et al.,* 2013), the genus *Hypleurochilus* Gill, 1861, includes 11 species of Atlantic origins. Some species of this genus are very similar in morphology and coloration. Considering this, it is not always possible to identify the species in the natural environment. Most of the species are present in the western part of the Atlantic Ocean, while the remaining species are present in its eastern part. *Hypleurochilus bananensis* (Poll, 1959) is the only species of the genus recorded in the Mediterranean Sea and its distribution extends to the Eastern Central Atlantic. The species was described in Congo (POLL, 1959). A few years later, it was first recorded in the Mediterranean Sea, along the Algerian coast, where it was wrongly described as a new species (BATH, 1965). In Mediterranean Sea, this species appears to be rare. Subsequent records have been reported for the eastern and central part of the basin, in Israel (BEN-TUVIA, 1971), Tunisia (GHARRED *et al.,* 1998) and Italy (TORTONESE, 1975; CATALANO, 1978; LANGENECK, 2013; TIRALONGO & VILLANI, 2014). Concerning Italian records, the species is only reported for Tyrrhenian and Ionian Sea and its presence is confined to specific environments: coastal lagoons highly impacted by human activities. Due to its rarity, the biology of this species is poorly known. In particular, information about its reproduction, feeding habits and habitat are lacking or scarce. In literature, the morphological and chromatic description of this species refers to female specimens (ZANDER, 1986); furthermore, two photographs are available on FishBase (by Wirtz) and show two female specimens (FROESE & PAULY, 2014). In the two sexes, colors and morphology are very different, especially during breeding season. Based on several hours of observation and study in both natural environment and laboratory, we report new data for this rare species. In particular, we analyze and discuss about sexual dimorphism, habitat preference, abundance and presence in Italian waters. In conclusion, we provide new information about the biology and ecology of this species with notes about reproduction, distribution and presence, providing new records for Italian seas. The fish external morphology was carefully examined with emphasis on sexual dimorphism.

## MATERIAL AND METHODS

Snorkelling and SCUBA diving were conducted in summer and in autumn (from June to November) in the period from 2011 to 2014. The selected areas for this study were two coastal lagoons located in the Central Tyrrhenian and in Northern Ionian Sea (Fig. 1). In both coastal lagoons, investigation was carried out once a month for a total of 48 immersions during the study period. Observations were carried out on artificial rocky bottoms of the canals that connect the lagoons with the sea and along the wharf, between 0 and 5 meters of depth. For each observation, we recorded: sex, estimated total length and depth. Five specimens were photographed to show the typical chromatic pattern in the natural environment (Fig. 2 and Fig. 3). A specimen of each sex was caught with a hand net in Tyrrhenian Sea and preserved in alcohol for subsequent laboratory analysis (Fig. 4). The main morphometric and meristic features were measured and the morphology of each sex was carefully described.

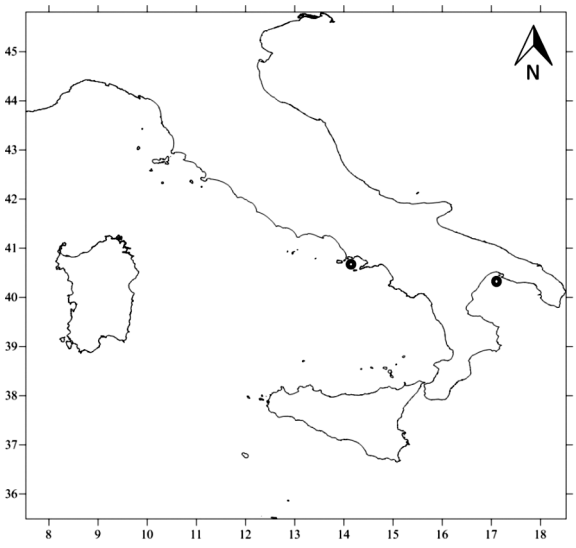


*Fig. 1. Locations of observations of H. bananensis*

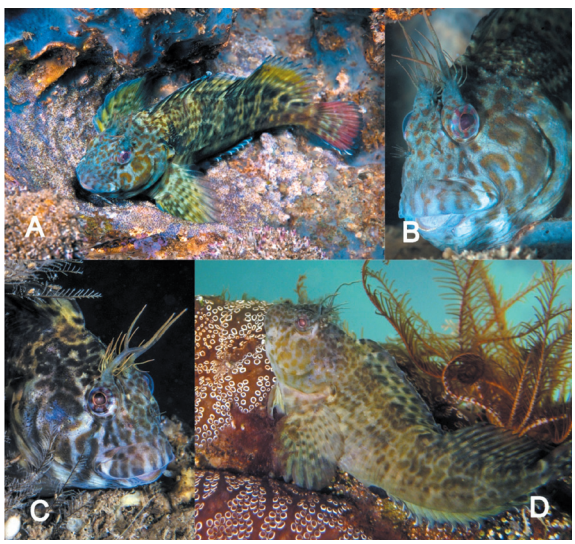


*Fig. 2. A: parental male that guard the eggs (Tyrrhenian Sea). B: detail of the head, note the morphology of the cirri and the bluish tinge. C: mature male with a bifid main branch in the cirri (Tyrrhenian Sea). D: mature male, note the blackish anal glands (Ionian Sea).*

## RESULTS

The species was never abundant and inhabited the intertidal area and very shallow waters. No specimens have been observed below the depth of 3 meters. At each survey, in Tyrrhenian Sea, the maximum number of observed specimens was of 4. In this area, at each survey, specimens were observed in the narrow canal between the sea and the coastal lagoon of the Lake Miseno. Several encrusting organisms as ascidians, bryozoans, algae and barnacles covered the hard

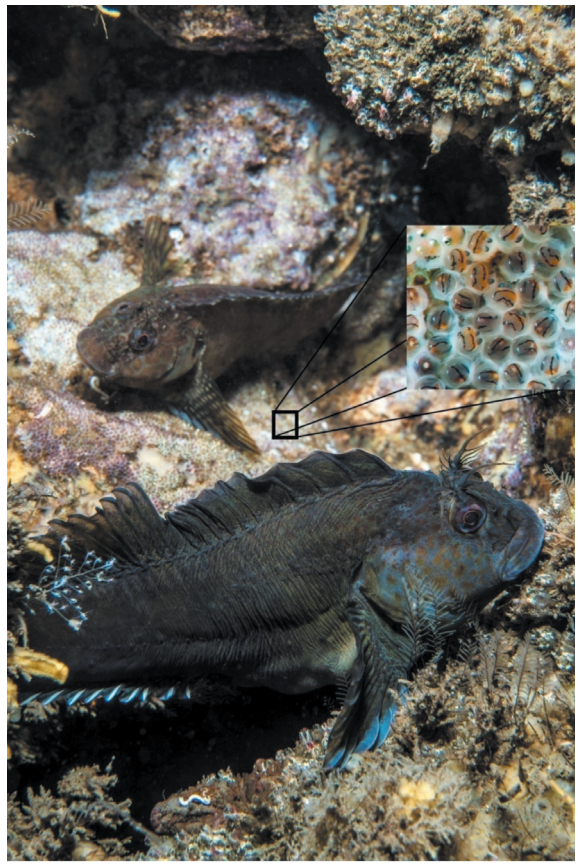

*Fig. 3. A rare picture that shows a couple of H. bananensis in the nest with eggs from the Tyrrhenian Sea. The male in foreground and the female in the rear. Note the blackish color of these specimens.*


*Fig. 4. Preserved specimens from the Tyrrhenian Sea. Male (A) and female (B).*

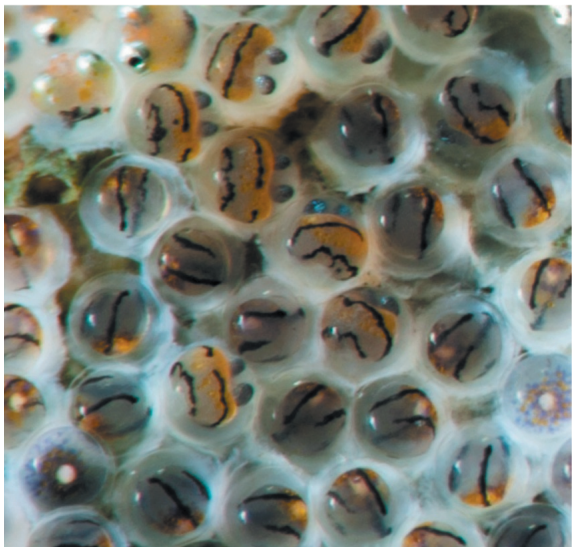

*Fig. 5. Eggs of Hypleurochilus bananensis.*

substrate of the canal. All the specimens of *H. bananensis* were observed only in a dim light area of the canal with deep crevices. The canal was inhabited by a fish community consisting of Sparidae (*Diplodus* spp.), Mugilidae, Moronidae (*Dicentrarchus labrax*) and some species of combtooth blennies (*Salaria pavo*, *Scartella cristata*, *Parablennius incognitus* and *Parablennius sanguinolentus*). Most of the specimens of *H. bananensis* were observed along the vertical wall of the canal, between crevices, from 0 to 2 meters in depth. Observations of females were sporadic. We never observed more than 1 female specimen per survey day. They were observed between crevices and on the pebbly bottom of the canal, until a depth of 3 m. Unlike the males, females were often observed swimming and then disappearing among crevices after a few seconds of observations. On the other hand, males were strictly territorial, especially when guarding the eggs. In the coastal lagoon of the Mar Piccolo of Taranto (Ionian Sea), the species was observed only in the years 2012-2014 and only in the months of June (2012), August (2013) and September (2014). Three specimens were mature males: 1 specimen in 2012 (30 cm in depth) and 2 specimens in 2013 (between 0.5 and 3 meters in depth). In September 2014, the only specimen observed was a female (at a depth of about 0.5 meters). The environment in the investigated area was similar to that in the Tyrrhenian Sea (Lake Miseno): hard substrate (near a canal of communication with the sea) encrusted by several sessile organisms. In particular, on the substrate there was a great abundance of polychaete tubeworms (*Sabella spallanzani*) and featherstars (*Antedon medi-*

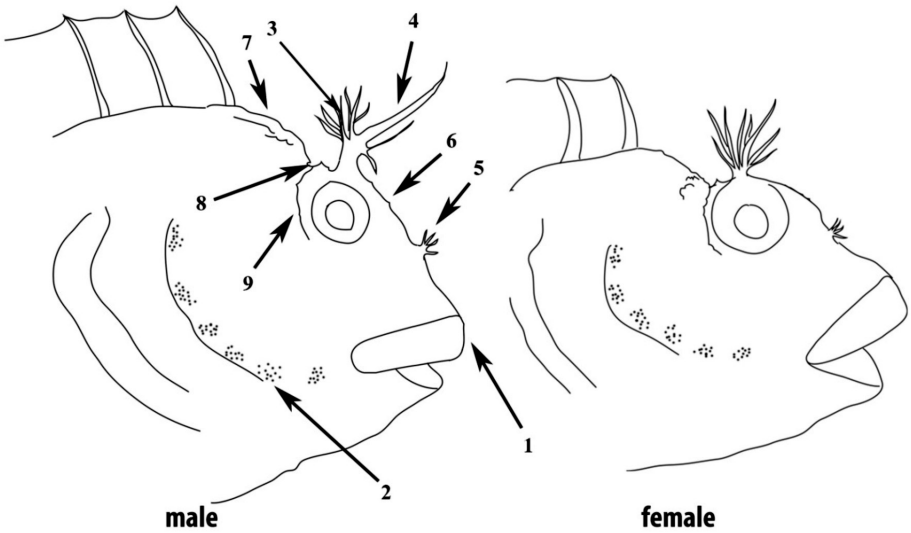


*Fig. 6. A simplified drawing for both sexes of the species. Morphological features are emphasized. 1. superior lip; 2. preopercular pores; 3. cirri; 4. main branch; 5. nasal tentacles (anterior nostrils); 6. keel-like projections; 7. nape with tubercle-like projections; 8. indentation; 9. crest-like projection.*

*Table 1a. Results of surveys in Tyrrhenian Sea. TL = total length; // = no observations*

| | **SURVEYS IN TYRRHENIAN SEA - Lake Miseno** | | | | | |
|---|---|---|---|---|---|---|
| | **2011** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 2 | 2 | 0 | 10-11 | // | 0.5-1 |
| **July** | 4 | 3 | 1 | 10-12 | 9 | 0.1-2 |
| **Aug.** | 4 | 3 | 1 | 10-12 | 9 | 0.1-1 |
| **Sept.** | 4 | 3 | 1 | 10-12 | 9 | 0.1-1 |
| **Oct.** | 3 | 2 | 1 | 10-11 | 9 | 0.1-2 |
| **Nov.** | 3 | 3 | 0 | 10-11 | // | 0.1-2 |
| | **2012** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 4 | 3 | 1 | 10-12 | 9 | 0.5-3 |
| **July** | 4 | 3 | 1 | 11-12 | 9 | 0.1-1 |
| **Aug.** | 4 | 3 | 1 | 11-12 | 9 | 0.1-2 |
| **Sept.** | 4 | 3 | 1 | 10-12 | 9 | 0.1-1.5 |
| **Oct.** | 3 | 3 | 0 | 10-12 | // | 0-2 |
| **Nov.** | 2 | 1 | 1 | 11 | 9 | 0.5 |
| | **2013** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 3 | 2 | 1 | 10-11 | 9 | 0-1 |
| **July** | 3 | 3 | 0 | 10-11 | // | 0.1-1 |
| **Aug.** | 4 | 3 | 1 | 10-11 | 9 | 0.1-1 |
| **Sept.** | 4 | 3 | 1 | 10-11 | 9 | 0.5-1.5 |
| **Oct.** | 1 | 0 | 1 | // | 9 | 3 |
| **Nov.** | 3 | 2 | 1 | 10-11 | 9 | 0.5-1 |
| | **2014** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 3 | 2 | 1 | 10-11 | 9 | 0.1-1 |
| **July** | 4 | 3 | 1 | 10-11 | 9 | 0-3 |
| **Aug.** | 4 | 3 | 1 | 10-11 | 9 | 0.5-1 |
| **Sept.** | 4 | 3 | 1 | 10-11 | 9 | 0.1-1 |
| **Oct.** | 2 | 2 | 0 | 10-11 | // | 0.1-0.5 |
| **Nov.** | 3 | 2 | 1 | 10-11 | 9 | 0.1-0.5 |

*Table 1b. Results of surveys in Ionian Sea. TL = total length; // = no observations. No specimens were observed in our 2011 surveys*

| | **SURVEYS IN IONIAN SEA - Mar Piccolo** | | | | | |
|---|---|---|---|---|---|---|
| | **2012** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 1 | 1 | 0 | 11 | // | 0.3 |
| **July** | 0 | 0 | 0 | // | // | // |
| **Aug.** | 0 | 0 | 0 | // | // | // |
| **Sept.** | 0 | 0 | 0 | // | // | // |
| **Oct.** | 0 | 0 | 0 | // | // | // |
| **Nov.** | 0 | 0 | 0 | // | // | // |
| | **2013** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 0 | 0 | 0 | // | // | // |
| **July** | 0 | 0 | 0 | // | // | // |
| **Aug.** | 2 | 2 | 0 | 10-11 | // | 0.5-3 |
| **Sept.** | 0 | 0 | 0 | // | // | // |
| **Oct.** | 0 | 0 | 0 | // | // | // |
| **Nov.** | 0 | 0 | 0 | // | // | // |
| | **2014** | | | | | |
| | | Sex | | TL (cm) | | |
| Months | Specimens observed | M | F | M | F | Depth (m) |
| **June** | 0 | 0 | 0 | // | // | // |
| **July** | 0 | 0 | 0 | // | // | // |
| **Aug.** | 0 | 0 | 0 | // | // | // |
| **Sept.** | 1 | 0 | 1 | // | 9 | 0.5 |
| **Oct.** | 0 | 0 | 0 | // | // | // |
| **Nov.** | 0 | 0 | 0 | // | // | // |

*terranea*). The results of surveys are reported in Table 1 (A: Tyrrhenian Sea; B: Ionian Sea). Males guarding the nests were observed from June to September, only in Tyrrhenian Sea. The site chosen for spawning was a small protected depression in the hard artificial substrate of the canal. Eggs appear whitish with yellowish and violet-blue spots (Fig. 5).

The general body color of the living animal is beige – brownish with 5-6 vertical dark bars, darker in the dorsal area and at the base of the dorsal fin. Several irregular dark brown spots are scattered on the body. Dorsal, anal and pectoral fins have a beige-brownish background color with dark brown spots. Between the first and the second ray of the dorsal fin an ocellus is present. It is not always visible, and can take on different colors: yellow, brown, blackish or bluish. The margin of the anal fin is black with white tips on the rays. Vertical dark bars are present on the caudal fin. The head is marbled with russet and whitish spots. The head of the parental male is intensely bluish-violet (Fig. 2B, Fig. 2C) and the distal part of the caudal fin is reddish (Fig. 2A).

*Table 2. Meristic and morphometric features for both sexes of Hypleurochilus bananensis*

| | Male | Female |
|---|---|---|
| Dorsal finrays | XII + 15 | XII + 15 |
| Anal finrays | II + 17 | II + 17 |
| Pelvic finrays | I + 4 | I + 4 |
| Pectoral finrays | 14 | 14 |
| Total length (mm) | 102 | 89 |
| Standard length (mm) | 86 | 76 |
| Head height (mm) | 23 | 18 |
| Dorsal fin length (mm) | 65 | 54 |
| Anal fin length (mm) | 42 | 37 |
| Eye diameter (mm) | 5 | 4 |
| Preopercular pores | 12 + (each position) | 11 + (each position) |

Furthermore, in the soft part of the dorsal fin there is a longitudinal yellow stripe. However, in both sexes, the body can assume an almost uniformly blackish color (Fig. 3).

In laboratory, all the main morphometric and meristic features were measured in both sexes (Table 2). After preservation in alcohol, specimens became almost uniformly blackish (Fig. 4). The mature male had a total length of 10.2 cm (Fig. 4A), while the female was 8.9 cm (Fig. 4B). In both sexes, the body is stout and more or less potbellied. The superior lip is well-developed. Cirri are manifold branched (12-13 branches). Their morphology, especially during breeding season, is very different: males have a more developed main branch (that can be bifid in some specimens, Fig. 2C), while in females cirri have branches of more similar size. However, in both sexes, the main branch is not exactly at the centre but lies anteriorly (Fig. 6). Nasal tentacles are present on the anterior nostrils only. They are branched (4-5 branches) and well-developed. Posteriorly to the eyes (well visible in lateral view), there is an indentation. The nape is wrinkled for the presence of tubercle-like projections. Between the eyes (well visible in frontal view of the head), there is a notch that extends to the snout. Laterally to this notch, there are two keel-like projections with slightly irregular edges. Posteriorly and dorsally to the eyes there is a crest-like projection, characterized by irregular edges. Males have a higher and more massive head than females (Fig. 4 and Fig. 6). A pair of posteriorly curved canine teeth are present on each jaw; those of the lower jaw are larger. Lateral line system is well developed with anteriorly positioned tubes. Preopercular pore series with 11 or more pores at each position (Fig. 6). Anal glands of the mature males are blackish and cerebriform. Furthermore, in mature male specimens the tips of the anal soft rays and of the caudal soft rays are more developed and assume a flattened shape.

## DISCUSSION

Curiously, in Italian seas, the presence of this species appears to be confined in two coastal lagoons of the Tyrrhenian and Ionian seas. In these areas, although we recorded only a small number of specimens, the species form stable populations. Furthermore, in Tyrrhenian Sea, the species is strictly confined in a small area of a canal of communications between the Lake Miseno and the sea. From direct observations, we can state further that *H. bananensis* is present in the nearby Lucrino Lake (and probably also in the other nearby coastal lagoons of the Phlegraean Fields area). On the other hand, in the Ionian Sea the species appears to be less common, but more widespread, in the lagoon of the Mar Piccolo. In other Italian coastal areas, the species has never been reported, not even in Palermo, were the species was first recorded in Italian seas (CATALANO, 1978). Furthermore, from our other investigations, and from the interviews with many underwater photographers and the examination of numerous photos of unidentified Italian blennies from other Italian areas, the presence of *H. bananensis* in other Italian coastal areas was not acknowledged. In our opinion, the presence of this species could be the result of Intra-Mediterranean transport by ballast waters of the ships. In fact, in Italian seas the species was always observed in harbour areas or in the immediate vicinity of areas that are considered "hotspots" for the introductions of alien species (OCCHIPINTI-AMBROGI, 2010). This would justify

the presence of the species only in Naples, Palermo and Taranto, known for the presence of big commercial ports. It has been shown that fishes of the family Blenniidae are among the most susceptible to ballast water transport (WONHAM *et al.,* 2000). Future investigations should be concentrated in other similar areas such as ports and coastal lagoons near ports and could lead to the discovery of specimens in other locations and to better understand species biology. On the other hand, a possibility of confusion with other combtooth blennies should also be considered, given the fact that male specimens, which are easier to observe, can be easily misidentified by non-specialistis.

Similar species that can be confused with *H. bananensis* belonging to the genus *Parablennius*: *P. gattorugine*, *P. pilicornis* and *P. incognitus*. *P. gattorugine*, the biggest species of the Blenniidae family in the Mediterranean Sea (maximum total length of about 30 cm), can be distinguished from *H. bananensis* by the different shape of the ocular tentacles (cirri). Although *P. gattorugine* also shows well-developed branched cirri on the eyes, secondary branches are not as long as in *H. bananensis*. Furthermore, the secondary branches of *P. gattorugine* originate from all the length of the main branch; while, in *H. bananensis* the secondary branches originate mainly from the basal part of the main branch. *P. pilicornis* and *P. incognitus* are similar in body shape and cirri structure. They differ from *H. bananensis* in having a slender body and less-developed cirri with a lower number of secondary branches. During breeding season, some male specimens of *P. pilicornis* show a blue tinge on the head that is similar to that of the male specimens of *H. bananensis* in breeding season. The other Italian species of the genus *Parablennius* (*P. rouxi*, *P. sanguinolentus*, *P. tentacularis* and *P. zvonimiri*) can be easily distinguished from *H. bananensis* by having different body shape, color pattern and/or cirri morphology.

Concerning sexual dimorphism, males and females differ in many chromatic and morphologic traits. Females are smaller with less bright colors; while males are brightly colored, and during breeding season show an intense bluish tinge on the head. Apart from the presence of anal glands, males are distinguished by having a more massive head with more developed branched cirri. Branches are longer and more stout (especially the main one) than in females. While males are easy to approach, especially in breeding seasons when they guard the nest, females are generally evasive. Because of the old description of the species (ZANDER, 1986), based exclusively on the description of the females and, however, not accurate, males in particular may be easily misidentified with combtooth blennies of other species that show similar colors and general morphology. Adult specimens inhabit cryptic environments of shallow waters, between crevices and encrusting organisms. In Tyrrhenian Sea, the species inhabits a dim-light area. In both in Tyrrhenian and Ionian Sea, all specimens were always observed in or nearby the canal of communication between the coastal lagoons and the sea. We believe that this behavior is at least in part associated with the feeding habits of the species. It seems they take advantage of the periodic tidal flow to feed on small invertebrates transported by the currents. Another noteworthy aspect that emerged from this study was the absence of observations of juveniles. Perhaps the larvae are transported away by the currents and settlement takes place in other unknown areas. Furthermore, in Ionian Sea, we have never observed males guarding the eggs, although all the male specimens were mature males with anal glands well developed (Fig. 2D). In Tyrrhenian Sea, males guarding the nest were observed from June to September. This indicates that *H. bananensis* breed in summer. In conclusion, at the current state of knowledge about the presence of this species in Italian seas, we can consider *Hypleurochilus bananensis* as a rare species, distributed only in coastal lagoons near ports with populations that are never abundant.

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# *Hypleurochilus bananensis* (Poll, 1959) (Pisces, Blenniidae) u talijanskom moru: rasprostranjenost, stanište i spolni dimorfizam

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## SAŽETAK

*Hypleurochilus bananensis* jedna je od najrjeđih vrsta slingurke (Blenniidae) u Sredozemnom moru. U cijelom mediteranskom bazenu zabilježene su samo nekoliko puta. Zbog svoje rijetkosti, H. *bananensis* se rijetko proučavala i malo se zna o biologiji te vrste. U ovom radu donosimo dodatne podatke o ovoj rijetkoj vrsti. Posebice opisujemo njihova staništa, spolni dimorfizam, te njihovu prisutnost i raspodjelu s nekoliko novih zapisa u Tirenskom i Jonskom moru. Istraživanja su provedena u razdoblju od 2011. do 2014. godine. Metode korištene prilikom promatranja su ronjenje s disalicom i SCUBA ronjenje. U prirodnom okruženju promatrali smo ponašanje i koloraciju obaju spolova. Ispitivali smo morfologiju kod dvije odrasle jedinke oba spola i iznijeli prve detaljne informacije o razlikama među njima. Spolni dimorfizam je vrlo izražen i prošli opisi ove vrste temeljili su se samo na ženskim primjercima. Ovo bi moglo dovesti do pogrešne identifikacije slučajeva. Doista, posebice morfologija i kromatski uzorak mužjaka, slični su onima drugih vrsta češljouste babice. Štoviše, naša izvješća donose podatke koji se tiču reprodukcije, preferencija staništa i razmatranja njihove prisutnosti u talijanskim morima.

**Ključne riječi:** *Hypleurochilus bananensis*, spolni dimorfizam, morfologija, Sredozemlje, Blenniidae, balastne vode, obalne lagune